PugetSoundPartnership
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Indicators and Benchmarks
Agenda Item #6

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Proposed Action: Discussion of Indicators and Benchmarks for the Action Agenda

Summary: The Partnership continues to develop indicators by which we will evaluate progress toward achievement of the Action Agenda goals. Each indicator will ultimately have a 2020 target and interim benchmarks. The Science Panel has overseen technical evaluation of available indicators. Input from the Ecosystem Coordination Board will inform ongoing discussions by staff, Science Panel members, and Leadership Council members about the strengths and weaknesses of identified indicators for performance management and communication.

Background: The attached letter from Joel Baker to David Dicks provides background on this issue.

Analysis: The success of the Partnership's performance management system will depend in part on adopting meaningful indicators, targets and benchmarks as the primary means by which the Partnership and others will gauge success in accomplishing our goals for restoring and maintaining the Puget Sound ecosystem. Available indicators adopted in 2008 will provide an initial approach to this key task. Continued evaluation of indicators, and evaluation and discussion of potential targets and benchmarks, are suggested by the Science Panel as a focus of the Partnership's adaptations in the coming years.

Next Steps:

- Deliver input from the Ecosystem Coordination Board and communications experts to Leadership Council and Science Panel members who are discussing indicators and benchmarks
- Identify targets and benchmarks for the recommended indicators
- Complete identification and recommendation of indicators for species, food webs, and biodiversity
- Select indicators of human well-being
- Adopt indicators and benchmarks as part of draft Action Agenda materials in October 2008

Memorandum

Date: August 18, 2008

To: David Dicks, Puget Sound Partnership Executive Director
From: Joel Baker, Science Panel Chair

Subject: Environmental Indicators and Benchmarks

Washington State statute, in RCW 90.71.290, specifies a role for the Partnership's Science Panel in identifying environmental indicators and recommending benchmarks. The Science Panel understands that indicators and benchmarks will be the means by which the Partnership will express the outcomes that describe success in restoring and maintaining the Puget Sound ecosystem, will specify how these outcomes will be quantified and how progress towards outcomes will be measured.

Thanks to a regional ecosystem indicators evaluation project led by staff from NOAA's Northwest Fisheries Science Center, we have made significant progress in key technical steps toward the adoption of indicators. This memorandum summarizes the status of work to date to identify indicators and benchmarks. Much more work will be needed including:

- Science Panel working with the Leadership Council, the Ecosystem Coordination Board and Partnership staff to finalize the Partnership's provisional indicators and benchmarks in 2008
- Additional technical development and evaluation of indicators over the next two years to ensure that outcomes, indicators, and benchmarks can be improved and refined as a focus of the Partnership's adaptive management efforts.

1. Adoption of Provisional Indicators in 2008

1.1 Identification of Indicators by the Science Panel. During the Science Panel's meeting on August 7, 2008, the panel identified lists of available, relevant environmental indicators for four of the Partnership's six goals: human health, habitat, water quantity and water quality. Short titles for the available, relevant indicators are presented in the attached tables.

Staff are compiling a summary of the specific measures referenced by the short titles listed in these tables. These summaries will include a short description of each indicator, its source, the extent of baseline information, and information about benchmarks and targets.

The panel has not yet identified indicators for species, food webs, and biodiversity. A team of panel members and staff continue to work with the list of candidate indicators to identify indicators of species and food webs in key subsystems of Puget Sound. This team should be able to report on its progress in late August.

Based on recommendations from staff at NOAA's Northwest Fisheries Science Center (Schneidler & Plummer 2008), the panel suggests that the Partnership pursue selection of human well-being indicators through discussions involving Partnership staff and leadership groups. Our suggested next steps are discussed in section 1.3 below.

1.2 Benchmarks & Targets. In discussing indicators and benchmarks on June 19, the Science Panel suggested that evaluation of benchmarks and targets will require a management or policy perspective that is not provided by the panel. The panel has committed to working with staff and the Partnership's other leadership groups to discuss the selection of benchmarks as part of the Partnership's adoption of indicators in 2008. The Science Panel perspective is that although there is limited scientific basis for selection of benchmarks and targets in 2008, we appreciate the need to adopt benchmarks to clearly specify outcomes such that the Partnership can hold itself accountable for ecosystem recovery efforts and can adapt implementation strategies.

1.3 Science Panel Contributions to Discussions of Indicators & Benchmarks. A committee of the panel has begun discussions with staff about the Partnership's adoption of suites of indicators for the four goals addressed in the attached tables. As the staff-panel team identifies candidate indicators for species, food webs, and biodiversity, these discussions will be broadened to include indicators of this goal. This committee of the panel will meet August 28 with members of the Leadership Council to discuss adoption of suites of indicators.

For human well-being, NOAA's staff report recommended that the affected community should be engaged in selection of indicators. Katherine (Trina) Wellman of the Science Panel will be discussing these indicators with staff and Leadership Council members in August.

2. Refining Indicators & Benchmarks as a Focus of Adaptive Management

Concurrent with its work on indicators, the Science Panel has been developing a science work plan for the coming two years. Our current draft of this work plan suggests that an important aspect of work in the months ahead will be to continue and extend scientific investigations to develop and evaluate indicators. The panel recommends that the Partnership's 2008 documents declare the Partnership's reliance on credible information and a commitment to periodically update its specifications of outcomes, indicators, and benchmarks.

Table 1: Recommended indicators* for human health

Action Agenda goal: A healthy human population supported by a healthy Puget Sound that is not threatened by changes in the ecosystem

Subcategory of goal	Drivers, pressures, influencing factors	State	Impact/Response
Contaminated seafood	(see water quality indicators for measures hat affect contaminants in seafood & contamination of shellfish growing areas)	(see water quality indicators for measures of toxics in seafood species)	• **Marine fish consumption advisory** • **Acres and trends in commercial shellfish growing area closures** • **Shellfish closures for PSP** • **Domoic acid contaminant levels** • *Shellfish consumption advisory* • *Freshwater fish consumption advisory*
Drinking water	(see water quality indicators for measures of fresh water affects drinking water quality)	• **Drinking water quality – toxics, nutrients** • *Quality of groundwater for drinking*	
Air quality		• **Air quality index -- # of good days** • **Air quality particulates**	
Swimming beaches			• *% swimming beaches that meet safe swimming standards*

* Bold entries identify good available indicators that are usable in their current format. Italicized entries identify potential available indicators that would require some additional evaluation or a modification or expansion for use by the Partnership. Indicators are presented according to the aspect of the ecosystem addressed: some indicators measure drivers and pressures that influence conditions of concern in the ecosystem; some indicators reflect the state of the ecosystem, some indicators measure impacts to ecosystem services or attributes, and some indicators reflect management responses.

Table 2: Recommended indicators for habitat

Action Agenda goal: A healthy Puget Sound where freshwater, estuary, near shore, marine, and upland habitats are protected, restored, and sustained
Action Agenda objectives: protect existing habitat and prevent further losses; restore habitat functions and values; improve water quality and habitat by managing storm water runoff

Subcategory of goal	Drivers, Pressures, Influencing Factors	State	Impact	Response
Marine/nearshore	• *Artificial fish barrier* • *Shoreline armoring* • *Changes in wetland acreage* • *Non-native invasives* • *Non-native invasive species threat*	• **Marine parameters** • **Eelgrass** • *Intertidal biotic community status & trend* • *Kelp (and other seaweeds)* • *Salt marsh*	• *Shoreline geomorphology change*	• *Fish passage barriers improvements*
Freshwater	• *Artificial fish barrier* • *Channel armoring* • *Non-native invasive species threat*	• **Freshwater parameters** • **Physical habitat** • *Maximum temperature* • *Floodplain connectivity*		• *Fish passage barriers improvements*
Terrestrial	• **Transportation pressure** • **Land cover trends** • **Road densities – erosion** • *Non-native invasive species threat*	• **Old growth forest lost** • *Change in wetland acreage*		

Table 3: Recommended indicators for water quantity

Action Agenda goal: An ecosystem that is supported by ground water levels as well as river and stream flow levels sufficient to sustain people, fish, and wildlife, and the natural functions of the environment
Action Agenda objective: Provide water for people, fish and wildlife, and the environment

Subcategory of goal	Drivers, Pressures, Influencing Factors	State	Impact	Response
Freshwater supply for people, fish, and wildlife		• **Snow pack** • **Glacier mass balance** • *Annual maximum daily flow* • *Annual mean flow* • *TQmean – flow flashiness* • *Annual 7-day low flow*		• *Violations of Ecology instream flows*
Freshwater supply to marine waters		• *Stream flow to Puget Sound*		
Water related hazards		• **Frequency of flood events**		

Table 4: Recommended indicators for water quality

Action Agenda goal: Fresh and marine waters and sediments of a sufficient quality so that the waters in the region are safe for drinking, swimming, shellfish harvest and consumption, and other human uses and enjoyment, and are not harmful to the native marine mammals, fish, birds, and shellfish of the region
Action Agenda objectives: Significantly reduce toxics entering Puget Sound fresh and marine waters; significantly reduce nutrients and pathogens entering Puget Sound fresh and marine waters; improve water quality and habitat by managing storm water runoff

Subcategory of goal	Drivers, Pressures, Influencing Factors	State	Impact
Toxics – marine	• **Oil spills** • *Toxics in biosolids from WWTPs*	• **Contamination in sediments** • **Toxics in benthic fish** • **Toxics in pelagic fish** • *Toxics in clams* • *Toxics in mussels* • *Fish tissue contaminants index* • *Contaminants in whole fish* • *Toxics in juvenile salmon* • *Toxics in osprey eggs* • *Toxics in harbor seals*	• **Liver disease in English sole** • *Acute toxicity in sediments* • *Sediment quality triad index*
Nutrients – marine	• **Marine water quality** • *Nutrient loadings in PS rivers* • *Sensitivity to eutrophication*	• **Nutrients in marine water**	
Pathogens – marine	• *Microbial pollution assessment – Sinclair/Dyes inlets*	• **Fecal pollution index for commercial shellfish beds** • **Marine water quality** • *Water quality index*	
Toxics – freshwater		• *Toxics in water* • *Toxics in fish* • *Toxics in juvenile salmon*	
Nutrients – freshwater		• *TSI – phosphorus levels in large lakes* • *TSI – phosphorus levels in small lakes* • *Water quality DO lakes*	
Pathogens -- freshwater		• **Stream water quality parameters** • *Fecal bacteria – streams* • *Fecal bacteria at lake non-swimming beaches* • *Water quality index*	
Other		• *Water temperature -- lakes*	